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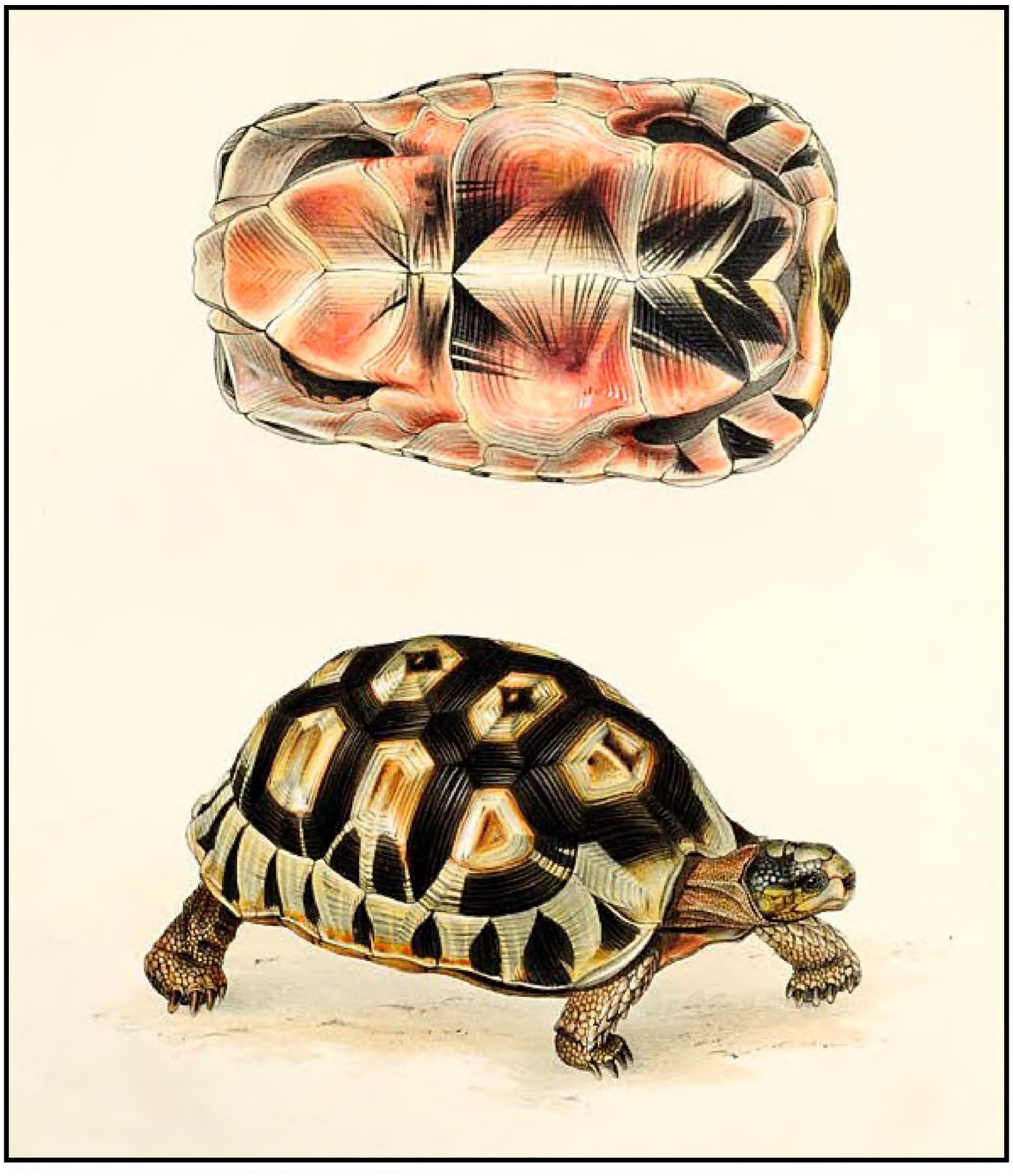

BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY
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Notes on the Herpetofauna of Nayarit, Mexico 4: List of Reptiles Collected on María Madre Island, San Blas, Nayarit, Mexico, by Herr Alphonse Forrer . . . . . Jesús Alberto Loc-Barragán and Juan Pablo Ramírez-Silva 49

Notes on the Herpetofauna of Nayarit, Mexico 5: First Record of *Conopsis biserialis* from the State of Nayarit . . . . . Emmanuel Miramontes-Medina, David Molina and Jesús Alberto Loc-Barragán 53

Serpentine Superlatives: Extreme Numbers—Large and Small . . . . . Van Wallach 54

Notes on Reproduction of Southern Cricket Frogs, *Acris gryllus* (Anura: Hylidae), from North Carolina . . . . . Stephen R. Goldberg 59

Minutes of the CHS Board Meeting, March 14, 2023 61

Herpetological Art at the Brookfield Zoo, Brookfield, Illinois—July 27, 2023 . . . . . Roger Carter 62

Cover: Bowsprit tortoise, *Chersina angulata*. Drawing (as *Testudo angulata*) from *A Monograph of the Testudinata* by Thomas Bell, 1832–1836.

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Notes on the Herpetofauna of Nayarit, Mexico 4: List of Reptiles Collected on María Madre Island, San Blas, Nayarit, Mexico, by Herr Alphonse Forrer

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Abstract

This study represents the first comprehensive compilation and analysis of Herr Alphonse Forrer's collections from the Tres Marías Islands and Nayarit, dating back to 1881. Data for 14 distinct reptile species were validated and updated, using resources from the Global Biodiversity Information Facility (GBIF), establishing a historical baseline for the region's biodiversity. The analysis highlights the importance of historical collections in understanding biodiversity and conservation. With the transformation of the Tres Marías Islands from a penal colony to an ecotourism destination, the study underscores the need to monitor biodiversity and the opportunity to combine conservation with sustainable development. This work emphasizes the importance of ongoing and comparative research for the effective conservation of these unique areas.

Resumen

Este estudio constituye la primera recopilación y análisis exhaustivos de las colecciones de Herr Alphonse Forrer en las Islas Tres Marías y Nayarit, datadas de 1881. Se validaron y actualizaron datos de 14 especies distintas de reptiles, utilizando los recursos del Global Biodiversity Information Facility (GBIF), estableciendo una línea base histórica para la biodiversidad de la región. El análisis resalta la importancia de las colecciones históricas en la comprensión de la biodiversidad y la conservación. Con la transformación de las Islas Tres Marías de una colonia penal a un destino de ecoturismo, el estudio subraya la necesidad de monitorear la biodiversidad y la oportunidad de combinar la conservación con el desarrollo sostenible. Este trabajo resalta la importancia de la investigación continua y comparativa para la conservación efectiva de estas áreas únicas.

Introduction

Herr Alphonse Forrer (Figure 1) was a dedicated natural history collector who collected zoological material along the west coast of Mexico and the United States for the British Museum (Breninger, 1899). As commissioned by Frederick DuCane Godman (1834–1919), he made extensive collections of mammals, birds, birds' nests and eggs, shells, reptiles and insects in the states of Durango and Sinaloa, and from the Tres Marías Islands off the coast of Nayarit, for the monumental Biologia Centrali-Americana project, an encyclopedia of the natural history of Mexico and Central America, (Breninger, op. cit.; Godman, 1915: p. 19; Flores-Villela et al., 2004; Feest, 2023). The Tres Marías Islands, known for their unique ecosystems and high levels of endemism, and Nayarit represent critical areas for the study of biodiversity and conservation. The specimens collected by Forrer in this insular region, comprising the Tres Marías Islands and the San Blas coast, have until today never been reported as a unit; they have only been the subject of scattered references: insects (Garcia-Aldrete, 1986); mammals (Nelson, 1899a; Bogan, 1978), birds (Nelson, 1899b; Stager, 1957; Grant and Cowan, 1964), fishes (Jordan, 1889), and reptiles (Boulenger, 1883; 1885–87; 1889; Stejneger, 1899; Boulenger, 1893–96; Blanchard, 1921; Stuart, 1935; Zweifel, 1960; Garcia-Aldrete, 1986). In light of the above, the British Museum, London, contains several specimens formerly unreported in the literature, and no detailed work on Alphonse Forrer has been published (Nelson, 1899c; Stager, 1957).

Figure 1. Herr Alphonse Forrer. Image from Breninger (1899).

This study represents the first comprehensive compilation and detailed analysis of Herr Forrer's collection in Nayarit and the Tres Marías Islands, thereby filling a gap in the scientific knowledge of biodiversity in this critical region. Through this work, we provide a holistic and updated view of the herpetofauna of these areas, offering new insights into their distribution, diversity, and conservation. The findings from this study are crucial for understanding the biological richness of the region and for guiding future conservation efforts.

Study site

The Tres Marías Islands, a Biosphere Reserve established in

1. Ciencia y Conservación para el Desarrollo de las Comunidades A.C., Tepic 63066, Nayarit, Mexico.

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Figure 2. Location of the Tres Marías Islands in the Pacific Ocean, off the coast of Nayarit, Mexico.

2000, are located in the Pacific Ocean off the coast of Nayarit, Mexico. Specifically, these islands are situated approximately 132 km from San Blas, Nayarit, 176 km from Mazatlán, Sinaloa, and 386 km from the port of Manzanillo, Colima. The archipelago consists of four primary islands: María Madre, María Magdalena, María Cleofas, and San Juanito, each boasting unique geological formations and rich biodiversity (Figure 2).

The islands' ecosystems are distinguished by a mix of tropical and subtropical environments, characterized by varied topography including cliffs, sandy beaches, rocky points, islets, and rocky reefs. The terrestrial landscapes are marked by abrupt volcanic terrains, with María Madre Island featuring the highest elevation at 640 meters. In contrast, San Juanito, the smallest island, has a more flat and low-lying topography.

These islands are home to a diverse range of flora and fauna, many of which are endemic species. The marine ecosystems surrounding the islands are equally rich, supporting a variety of marine life and coral reefs. This combination of terrestrial and marine biodiversity, along with the islands' isolated location, makes the Tres Marías Islands a critical area for the study of ecological processes and conservation efforts (CONANP, 2022). The Tres Marías Islands, historically known for housing a penal colony on María Madre Island, are transitioning into a tourist destination. This shift follows the closure of the federal prison, part of a national initiative to promote human rights. The Mexican government now plans to develop the islands into an ecotourism hub, focusing on sustainable tourism that preserves the unique natural beauty and biodiversity of the area. This transformation aims to balance environmental conservation with economic development, turning the islands into a location for visitors to explore and appreciate their rich natural and cultural heritage.

Methods

Utilizing the species catalogues from the Global Biodiversity Information Facility (GBIF), we conducted a comprehensive validation and updating process for the herpetofauna species of Nayarit as reported by Loc-Barragán et al. (2024). This process included correcting identification errors, resolving synonymies, and updating taxonomic classifications, with a particular focus on the species collected in María Madre Island and San Blas by Alphonse Forrer during his 1881 expedition. The validation involved cross-referencing GBIF data with the latest scientific literature and taxonomical databases to ensure the accuracy and current relevance of the species identifications and classifications specific to Forrer's collections.

Results

The reptile collection studied was assembled by A. Forrer on the Tres Marías Islands and the San Blas coast in Nayarit, Mexico As to when Herr Forrer actually visited Isla María Madre and collected the specimens, Zweifel (1960: p. 90) says "There appears to be no published record of the amount of time Forrer spent on the islands, though the dates March 10 and April 23, 1881, accompany accounts of mammals from the islands in the 'Biologia Centrali-Americana'." The collection comprises 49 specimens, numbered from 74 to 112 on the accession list of the British Museum (Natural History) [NHMUK] for 1 October 1881. The specimens represent 14 distinct species across the families Dactyloidae, Iguanidae, Phrynosomatidae, Phyllodactylidae, Teiidae, Colubridae, Dipsadidae, Viperidae and Kinosternidae. Notable findings include species such as *Anolis nebulosus, Urosaurus ornatus*, and *Agkistrodon bilineatus*. Each specimen, along with its collection details and previous references, is listed in Table 1, providing a comprehensive overview of Forrer's herpetological collection.

Discussion and conclusion

This study represents a significant step in documenting the biodiversity of the Tres Marías Islands and the Nayarit region, providing the first comprehensive compilation and detailed analysis of Herr Alphonse Forrer's collections from 1881. Our research highlights the importance of historical collections in understanding ecological dynamics, serving as a baseline for future ecological studies and conservation efforts in the region. Through meticulous cataloging and validation of various reptilian species, including notable specimens like *Anolis nebulosus* and *Agkistrodon bilineatus*, we have not only enriched the historical record of the region's herpetofauna but also established a reference point for current and future ecological studies. This work underscores the dynamic nature of biodiversity and the ongoing need to monitor and preserve these unique ecosystems.

While our study offers a foundational understanding, it also reveals gaps in historical data, indicating the need for continued research in the region. Future studies should focus on a comparative analysis with current biodiversity data to assess changes over time and inform conservation strategies. Through such efforts, we can better understand and respond to the environmental challenges facing the Nayarit region and its unique ecosystems, contributing to global conservation efforts and the sustainable use of natural resources.

Reflection

This study on Herr Alphonse Forrer's collections in the Tres Marías Islands carries profound implications for biodiversity conservation. It provides an essential historical baseline for understanding changes in biodiversity over time, crucial for formulating effective conservation strategies. As the islands transform into an ecotourism destination, the study highlights the importance of tourism development that supports conservation and educates visitors about the region's unique biodiversity. It also emphasizes the need for continuous monitoring of biodiversity and careful management of ecotourism to protect these unique ecosystems and their endemic species. In summary, the research offers valuable insights for informed and sensitive conservation in the Tres Marías Islands, ensuring the preservation of their natural richness for the future.

Acknowledgments

To the Universidad Autónoma de Nayarit and the "Patronato UAN" for providing funding through the "University Productivity through Research" program, from the special tax allocated to UAN 2023 and GBIF for allowing the research public to have databases of scientific collections from around the world. To Mike Dloogatch, for his comments and improvements to the manuscript.

Table 1. Reptiles from Isla María Madre and the San Blas coast, Nayarit, Mexico, collected by A. Forrer, and deposited 1 October 1881 in the British Museum (Natural History) [NHMUK].

Family Dactyloidae (1) **1.** *Anolis nebulosus* (Wiegmann, 1834), collected by A. Forrer on María Madre Island (NHMUK 1881.10.1.83-85). See GBIF (2023a). These specimens referenced by Stejneger (1899).
Family Iguanidae (1) **2.** *Ctenosaura pectinata* (Wiegmann, 1834), collected by A. Forrer on María Madre Island (NHMUK: 1881.10.1.75-80).
Family Phrynosomatidae (1) **3.** *Urosaurus ornatus* (Baird & Girard, 1852), collected by A. Forrer on María Madre Island (NHMUK 1881.10.1.91-94). See GBIF (2023b). These specimens referenced by Boulenger (1883).
Family Phyllodactylidae (1) **4.** *Phyllodactylus saxatilis* Dixon, 1964, collected by A. Forrer on María Madre Island (NHMUK 1881.10.1.89-90). See GBIF (2023c).
Family Teiidae (1) **5.** *Aspidoscelis communis* (Cope, 1878), collected by A. Forrer on María Madre Island (NHMUK 1881.10.1.81-82, 1881.10.1.86-88). See GBIF (2023d). These specimens referenced by Günther (1885–1902) and Stejneger (1899).
Family Colubridae (6) **6.** *Drymarchon melanurus* (Duméril, Bibron & Duméril, 1854), collected by A. Forrer on María Madre Island (NHMUK: 1881.10.1.109-110).
7. *Lampropeltis polyzona* Cope, 1860, collected by A. Forrer on María Madre Island (NHMUK 1881.10.1.97-99). See GBIF (2023e). These specimens referenced by Boulenger (1893-1896), Stejneger (1899), Blanchard (1921) and Stuart (1935).
8. *Leptophis diplotropis* (Günther, 1872), collected by A. Forrer on María Madre Island (NHMUK 1881.10.1.104-105). See GBIF (2023f). These specimens referenced by Stejneger (1899).
9. *Mastigodryas melanolomus* (Cope 1868), collected by A. Forrer on María Madre Island (NHMUK 1881.10.1.103; 1881.10.1.108; 1882.). See GBIF (2023g).
10. *Tantilla calamarina* Cope, 1866, collected by A. Forrer on the San Blas coast (NHMUK 1881.10.1.112). See GBIF (2023h).
11. *Oxybelis microphthalmus* Barbour & Amaral, 1926, collected by A. Forrer on María Madre Island (NHMUK 1881.10.1.107). See GBIF (2023i).
Family Dipsadidae (1) **12.** *Imantodes gemmistratus* (Cope, 1861), collected by A. Forrer on María Madre Island (NHMUK 1881.10.1.101). See GBIF (2023j).
Family Viperidae (1) **13.** *Agkistrodon bilineatus* (Günther, 1863), collected by A. Forrer on María Madre Island (NHMUK 1881.10.1.95-96). See GBIF (2023k).
Family Kinosternidae (1) **14**. *Kinosternon integrum* LeConte, 1854, collected by A. Forrer on María Madre Island (NHMUK 1881.10.1.74; 1881.10.1.111). See GBIF (2023l). These specimens referenced by Boulenger (1889).

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————. 2023c. *Phyllodactylus tuberculosus* Wiegmann, 1834. [doi.org/10.15468/dl.23h928].

————. 2023d. *Aspidoscelis communis* Günther, 1885. [doi.org/10.15468/dl.z5vfuu].

————. 2023e. *Lampropeltis polyzona* Cope, 1860. [doi.org/10.15468/dl.razy8n].

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————. 2023g. *Mastigodryas melanolomus* (Cope 1868). [doi.org/10.15468/dl.y5wzmn].

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Notes on the Herpetofauna of Nayarit, Mexico 5: First Record of *Conopsis biserialis* from the State of Nayarit

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Keywords: Colubridae, Conopsis, Serpentes, Squamata

Introduction

The Twin-spotted Mexican Earth Snake (*Conopsis biserialis*) (Figure 1) is endemic to Mexico and is known from central and southern Mexico, in the states of Jalisco, Colima, Michoacán, Guanajuato, Estado de México, Ciudad de México, Morelos, Puebla, and Hidalgo (Goyenechea and Flores-Villela, 2006). It was listed as potentially in Nayarit by Loc-Barragán et al. (2024) It occurs at elevations from 1700 to 3080 masl; in pine forest, oak forest, and montane cloud forest. It can be found under rocks and logs during throughout the year, although it is most commonly encountered during the summer rainy season, from June to September (Goyenechea and Flores-Villela, op. cit.). According to the IUCN Red List the conservation status of *C. biserialis* is "Least Concern" (Canseco-Márquez et al., 2007). According to Mexican wildlife law, the species is listed under "A = threatened" (SEMARNAT, 2019). The species has an environmental vulnerability score (*sensu* Wilson et al., 2013) of 13, placing it at the higher limit of the medium vulnerability category; this score places them between medium and high vulnerability.

Distribution Record

MEXICO: NAYARIT: Municipio de Xalisco: Sierra San Juan (21.448291°N, 104.974646°W; WGS 84; 2217 m elev). 11 July 2021. Emmanuel Miramontes-Medina. Verified by Christoph Grünwald. A photo voucher of the individual was deposited in the Colección Herpetológica, Universidad Michoacana (CHUM-F417). This snake was found under a pine log during the day in pine forest characterized by Douglas Pine *(Pinus douglasiana)* and Michoacan Pine (*P. devoniana).* This observation was added to the iNaturalist platform as: https://www.inaturalist.com/observations/88016263.

Discussion

This record represents the first report from the state of Nayarit, and it expands the known range ca. 206 km (airline) to the northwest from 7 miles E of Tapalpa, Sierra de Tapalpa, Jalisco, based on AMNH 102514-15 (GBIG, 2024). The elevation and habitat are consistent with where this species has been reported throughout its distribution across the Trans-Mexican Volcanic Belt Ranges and Sierra Madre del Sur in adjacent states (Goyenechea and Flores-Villela, op. cit.).

Acknowledgments

We thank Christoph Grunwald for verifying the identity of the snake and Jonatan Torres-Pérez-Coeto for cataloguing the digital photos and providing the voucher numbers.

Figure 1. *Conopsis biserialis* from Nayarit reported herein. Photograph by Emmanuel Miramontes-Medina.

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Serpentine Superlatives: Extreme Numbers— Large and Small

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Introduction

In the process of gathering data for a universal identification guide for snakes, I have come across some interesting figures that I think might be of interest to serpent nerds. This paper contrasts the most extreme ophidian characteristics, including the most and the fewest quantitative characters, the largest and smallest mensural (i.e., measurable) characters, and the greatest and least meristic (i.e., countable) characters. Most of the data presented herein relates to the extreme character states of individual species.

When Linnaeus (1758) proposed his modern classification for the animal kingdom, he described 101 snake species. Boulenger's (1896) British Museum catalogue raised the number of known species to 1639 and Werner's (1929) catalogue increased the snake species to 2242. Frank and Ramus (1995) listed 2542 snake species and Wallach et al. (2014) tabulated 3509 living snake species. There are currently 4258 recognized snake species (Wallach, unpubl.) with a considerable number being controversial (Midtgaard, 2023; Uetz et al., 2023). Some 750 new species have been described over just the past decade, partly due to the increase in molecular studies that are revealing novel and cryptic forms.

Materials and Methods

I have been collecting data on snakes from specimens in the field (ca. 2500), laboratory dissections (6000), preserved specimens examined in museums (ca. 1000) and received in 425 loans, and the scientific and lay literature for more than 50 years. Due to the differences in snakes between the various higher taxonomic groups, I divided my databases into three taxa (infraorders or superfamilies): Scolecophidia (blindsnakes, wormsnakes and threadsnakes) with 484 species, Henophidia (primitive snakes including aniliids, uropeltids, pythonids, boids, etc.) with 241 species, and Caenophidia (advanced or derived snakes, including acrochordids and colubroids) with 3533 species. Thus, comparisons can be made within and between each group. The common names used herein, with which I have little familiarity, are taken from Frank and Ramus (1995) and Midtgaard (2023). It will be noticed that a common name can apply to a number of different, unrelated species (i.e., rat snake, garter snake, water snake, etc.), which is why only unique Latin names are used by the scientific community.

Results

Names. Let's take a look at scientific nomenclature. All animals are identified by two Latin names, a genus and a species (e.g., human beings are *Homo sapiens*). All names at the generic level and above (i.e., family, tribe, order) are capitalized and all species (and subspecies) are written in lower case. How many snakes have identical generic and specific names? I could find only eight, as follows: *Cerastes cerastes* (greater horned viper), *Clelia clelia* (mussurana), *Enhydris enhydris* (striped mud snake), *Hemachatus haemachatus* (rinkhals), *Hypnale hypnale* (humpnose pitviper), *Naja naja* (spectacled cobra), *Natrix natrix* (grass snake), and *Suta suta* (eastern curl snake). In addition to those, another six snakes have species names similar but not identical to the generic name: *Bungarus bungaroides* (hill krait), *Dendrophidion dendrophis* (forest racer), *Laticauda laticaudata* (blue-lipped sea krait), *Popeia popeiorum* (Pope's pitviper), *Storeria storerioides* (brown snake), and *Vermicella vermiformis* (worm-like bandy-bandy). There may be other examples that are in synonymy and not currently recognized but none come to mind at present. Which specific name is applied to the most species? The most prevalent name is eponymous after the famous herpetologist, George Boulenger; there are 29 species named *boulengeri.* Next on the list is *lineatus* (plus *lineata* and *lineatum* depending upon gender of the generic name) with 21 species, *bicolor* with 15 species, *maculatus* (plus *maculata*) with 14 species, *guentheri* (eponymous after the herpetologist Albert Günther) with 13 species, both *fuscus* (plus *fusca*) and *punctatus* (plus *punctata* and *punctatum*) with 12 species, *carinatus* (plus *carinata*), *occidentalis* and *reticulatus* (plus *reticulata*) with 11 species each, and *annulatus* (plus *annulata*), *collaris*, *elegans*, *gracilis*, and *ornatus* (plus *ornata*) each with 10 species.

Genera. Which are the genera with the largest number of species? The most speciose genus is *Atractus* (ground snakes) with 151 species, followed by *Micrurus* (coral snakes) with 92, *Oligodon* (kukri snakes) with 89, *Lycodon* (wolf snakes) with 80, *Calamaria* (reed snakes) and *Tantilla* (centipede snakes) with 68, *Bothrops* (lancehead pitvipers) with 63, *Dipsas* (snail eaters) and *Erythrolamprus* (false coral snakes) with 55, *Geophis* (earthsnakes) with 54, *Crotalus* (rattlesnakes) with 53, *Dendrelaphis* (bronzebacks) with 49, and *Anilios* (blindsnakes) with 48. On the other hand, the smallest genera contain only a single species and there are nearly 200 such monotypic (= single species genus) genera (9 scolecophidians, 12 henophidians and 171 caenophidians). The size of snake genera therefore ranges from one to 151 species.

Biodiversity. Which country has the largest number of species within its border? It is difficult to say with any certainty because of our knowledge in the areas of taxonomy, geographic ranges, and collecting but a reliable estimate is as follows. Mexico appears to have the most with 455 species (300 in the state of Oaxaca alone), closely followed by Brazil with 440 species, Indonesia with 390, India with 345 species, Colombia with 325 species, China with 300 species, Vietnam with 250, Thailand with 235, Australia with 220 species, Ecuador and Peru with 215, and Venezuela with 200. Which countries, if any, have the fewest number of snake species? Only three countries in the world are entirely snakeless: Iceland, Ireland and Greenland have no snakes. New Zealand has no terrestrial

species but the marine *Pelamis platura* (yellow-bellied sea snake) is present. Some small islands in the Pacific Ocean (i.e., Midway) have only one terrestrial snake, *Virgotyphlops braminus* (flowerpot blindsnake).

Elevation. Several snake species are known to live above 4000 m (13,125 ft) in elevation: *Atractus variegatus* (variegated spindle snake), *Crotalus transversus* (cross-banded mountain rattlesnake), *Hemorrhois ravergieri* (mountain whipsnake) *Lystrophis semicinctus* (tricolor hognose snake), and *Vipera monticola* (Atlas dwarf viper) at 4000 m, *Dipsas lavillai* (Argentine slug eater) at 4100 m, *Thermophis zhaoermii* (Sichuan hot-spring snake) at 4150 m, *Atractus vertebralis* (vertebral spindle snake) at 4295 m, *Incaspis amaru* (Azuay bush racer) at 4450 m, *Crotalus triseriatus* (dusky rattlesnake) at 4570 m, *Tachymenis peruviana* (scrub snake) at 4600 m. The record is shared between two species, *Thermophis baileyi* (Tibetan hot-spring snake) and *T. shangrila* (Shangri-La hot-spring snake) at 4890 m (16,045 ft). However, the genus with the most high-altitude species is the ovoviviparous *Gloydius* (mamushis), having *G. monticola* (mountain mamushi) at 3960 m, *G. caraganus* (Karaganda mamushi) at 4000 m, *G. strauchi* (Strauch's mamushi) at 4600 m, *G. rubromaculatus* (red-spotted mamushi) at 4770 m, and *G. himalayanus* (Himalayan mamushi) at 4880 m.

The lowest elevations for snake species on earth are found in *Telescopus dhara* (tiger cat snake) at 430 m below sea level (mbsl) in the Dead Sea, *Psammophis schokari* (desert sand snake) and *Spalerosophis diadema* (diadem snake) at 400 mbsl, *Platyceps sinai* (banded racer) at 375 mbsl, *Eirenis coronella* (crowned dwarf snake) and *Platyceps saharicus* (Saharan cliff racer) at 370 mbsl, and *Dolichophis jugularis* (large whipsnake) and *Echis coloratus* (painted carpet viper) at 360 mbsl. In fresh water, *Gerarda prevostiana* (glossy marsh snake) can dive to 30 m and *Boulengerina annulata* (water cobra) has been recorded at 25 m deep; in the ocean, one species of *Hydrophis* (sea snake) holds the marine record of diving to a depth of 245 m (800 ft). Snakes are thus found from 430 m below sea level to 4890 m in elevation.

Size (length and weight). The largest snakes (length-wise and weight-wise) are henophidians. There is still controversy over what is the longest species and there are reports of giant snakes reaching 10–15 m, but they have not all been verified. However, *Malayopython reticulatus* (reticulated python) appears to be the longest snake with reports of 9.0–10.1 m (31 ft), followed closely by *Python sebae* (rock python) at 9.8 m, *Nyctophilopython oenpelliensis* (Oenpelli python) at 9.8 m, and *Eunectes murinus* (green anaconda) at 7.6–8.7 m (Murphy and Crutchfield, 2019). The giant among the Scolecophidia is *Megatyphlops mucruso* (giant blindsnake) at 0.95 m whereas the longest species in the Caenophidia are *Ophiophagus hannah* (king cobra) at 5.85 m, *Dendroaspis polylepis* (black mamba) at 4.50 m, *Oxyuranus scutellatus* (small-scaled snake) at 4.30 m, *Notechis scutatus* (tiger snake) at 4.00 m, *Lachesis muta* (bushmaster) and *Ptyas mucosus* (dhaman) at 3.75 m, and *Zaocys carinatus* (carinated rat snake) at 3.73 m. Scolecophidians are the smallest snakes with *Tetracheilostoma carlae* (Barbados threadsnake) having neonates measuring 26 mm (1 in) and *Virgotyphlops braminus* (flowerpot blindsnake) with neonates at 35 mm. The smallest Henophidia neonate is *Anilius scytale* (coral pipesnake) at 70 mm and the shortest Caenophidian neonate is *Storeria dekayi* (Dekay's snake) at 42 mm.

Weight-wise, *Eunectes murinus* (green anaconda) is the heaviest snake with a weight of 250 kg (550 lbs), followed by *Python molurus* (Indian python) at 182 kg, *Malayopython reticulatus* (reticulated python) at 170 kg. The heaviest caenophidian is *Crotalus adamanteus* (eastern diamondback) at 15 kg followed by *Bitis gabonica* (Gaboon viper) at 11 kg. The lightest snake is *Virgotyphlops braminus* (flowerpot blindsnake) with neonates weighing as little as 0.1 gm and adults as little as 0.7 gm. Snake lengths and weights run the gamut from 26 mm and 0.1 gm to 10,100 mm and 250,000 gm.

Ventrals and middorsals. In the Scolecophidia, which lack enlarged ventral scutes, the longitudinal scale rows are counted middorsally between the rostral and terminal tip (approximately equal to the midventral count, minus the subcaudals, but providing a more accurate value). The record holder for most middorsals is *Letheobia akagerae* (gracile blindsnake) at 834, followed by *Anilios leptosoma* (Murchison blindsnake) with 798 and *Gerrhopilus persephone* (Normandy blindsnake) at 780. The minimal number of middorsals belongs to *Amerotyphlops paucisquamus* (small-scaled blindsnake) with 169. Within the Henophidia, the highest number of ventrals is found in *Nyctophilopython oenpelliensis* (Oenpelli python) with 455; in the Colubroidea the record number of ventrals belongs to *Enhydrina schistosa* (beaked sea snake) at 514. Among the Henophidia the fewest ventrals have been recorded in *Uropeltis ceylanica* (shieldtail) at 119. That minimal number is surpassed in the Caenophidia by several species, with *Erpeton tentaculatum* (tentacled snake) and *Duberria lutrix* (slug eater) tied at 91. Ventral scutes therefore range from 91 to 455 in higher snakes while middorsals vary from 169 to 834 in scolecophidians.

Subcaudals. The greatest number of subcaudals is found in the Caenophidia with *Acrochordus javanicus* (elephant-trunk snake) having 251, followed by *Ahaetulla prasina* (jade whipsnake) with 235 and *Uromacer oxyrhynchus* (sharp-nosed vine snake) with 224. Among the Henophidia the record number of subcaudals belongs to *Nyctophilopython oenpelliensis* (Oenpelli python) at 170, followed by *Casarea dussumieri* (keel-scaled boa) with 133 and *Chondropython azurea* (green tree python) with 132. The record number of subcaudals in the Scolecophidia belongs to *Myriopholis algeriensis* (threadsnake) at 58. The fewest subcaudals occur in snakes with the shortest tails (Scolecophidia and some henophidians). *Rhinophis homolepis, R. mendesi, R. philippinus* and *R. zigzag* (sharp-nosed shieldtails) have the fewest subcaudals at three, followed by *Uropeltis saffragamus* (large shieldtail) and five species of *Cylindrophis* (pipesnakes) with only four. Among the Scolecophidia, *Afrotyphlops obtusus* (obtuse blindsnake) has only four subcaudals and seven species are tied with only five subcaudals (*Afrotyphlops steinhausi* (Steinhaus's blindsnake), *Amerotyphlops microstomus* (small-mouthed blindsnake) and *A. tasymicris* (Grenada blindsnake), *Argyrophis siamensis* (Siamese blindsnake), *Letheobia jubana* (gracile blindsnake), *L. wittei* (Witte's gracile blindsnake), and *Typhlops coecatus* (Ghanese blindsnake). Within the Caenophidia, *Calamaria*

septentrionalis (northern reed snake) has six subcaudals and *Brachyophis revoili* (Revoil short snake) and *Calamophis kateandersae* (Kate Anders' mud snake) are tied with eight subcaudals. The range of subcaudals in snakes is therefore from three to 251.

Ventral/subcaudal count ratio. Nearly all snakes have fewer tail vertebrae (and subcaudals) than body vertebrae (and ventrals). However, a number of arboreal tree snakes and terrestrial racers have tails with more subcaudals than ventrals. All of the following species have some individuals with more subcaudals than ventrals: *Ahaetulla isabellina* (long-nosed whipsnake), *Dendrelaphis bifrenalis* (black-striped bronzeback) and *D. levitoni* (Leviton's bronzeback), *Erpeton tentaculatum* (tentacled snake), *Gongylosoma longicaudum* (long-tailed ring-neck), all *Leptophis* (parrot snakes), *Liopholidophis dolico-cercus* (eastern rainforest smooth snake) and *L. grandidieri* (Grandidier's water snake), *Oxybelis aeneus* (brown vine snake) and *O. brevirostris* (short-nosed vine snake), *Spilotes sulphureus* (puffing rat snake), *Thelotornis usambaricus* (Usambara bird snake), and all *Uromacer* (pointed vine snakes). The record, however, belongs to *Cercophis auratus* (Atlantic liana snake), whose ventrals range from 135 to 152 and the subcaudals from 121 to 179, with nearly every individual having about 20 more subcaudals than ventrals. The relative tail length in this species (ratio of tail length divided by total length) is 41.8–53.6%.

Relative tail length. The ratio of the tail length/total length is a measure of the snake's relative tail length. The shortest tails, relatively speaking, are found among burrowers and the longest tails among arboreal species with terrestrial and aquatic species falling in between. Within the Scolecophidia the longest tails are found in leptotyphlopids with *Myriopholis longicauda* (long-tailed threadsnake) at 20.0% total length and *Trilepida dimidiata* (dainty threadsnake) at 19.2%. However, the longest typhlopoid tail is only 9.0% in *Ramphotyphlops cumingii* (Cuming's blindsnake). The shortest tail is found in the typhlopid *Amerotyphlops microstomus* (small-mouthed blindsnake) at 0.4%. Among the other scolecophidian families the shortest tails are as follows: in the Anomalepididae, *Helminthophis praeocularis* (inter-Andean blindsnake) at 1.0%, in the Gerrhopilidae, *Gerrhopilus thurstoni* (Thurston's blind-snake) at 1.5%, in the Xenotyphlopidae, *Xenotyphlops grandidieri* (round-nosed blindsnake) at 0.7%, and in the Leptotyphlopidae, *Siagonodon septemstriatus* (seven-striped threadsnake) at 2.1%. The longest relative tails in the Henophidia belong to *Casarea dussumieri* (keel-scaled boa) at 28.5% and *Corallus cookii* (Cook's tree boa) at 23.8% whereas the shortest tails are found in *Rhinophis zigzag* (zigzag shieldtail) and *Uropeltis saffragamus* (yellow shieldtail) at 1.6%, followed by *Cylindrophis ruffus* (red pipesnake) at 1.7%. Within caenophidians, snakes having tails more than half of their total length are *Liopholidophis grandidieri* (Grandidier's water snake) at 56.2%, *Cercophis auratus* (Atlantic liana snake) at 53.6%, *Nothopsis rugosus* (rough coffee snake) and *Philodryas arnaldoi* (Arnaldo's bush racer) at 52.0%, and *Chironius fuscus* (brown sipo) at 50.9%. The shortest caenophidian tails are found in *Calamaria virgulata* (blunt-tailed reed snake) at 2.2%, *Polemon fulvicollis* (yellow-necked snake eater) at 3.0%, *Atractaspis reticulata* (reticulate stiletto snake), *Calamophis katesandersae* (Kate Sanders's stout-tailed snake), and *Micrurus mipartitus* (red-tailed coral snake) at 3.6%, *Leptomicrurus narduccii* (slender black coral snake) and *Maticora bilineata* (two-striped coral snake) at 3.7%, and *Amblyodipsas polylepis* (purple-glossed snake) and *Vermicella snelli* (Snell's bandy-bandy) at 3.9%. The length of a snake's tail varies from 0.4% to 56.2% of the total length.

Midbody scale rows. The number of scale rows around the midbody region, even though more stable than the anterior and posterior counts, shows considerable variation. In the Scolecophidia, which normally have an even number of rows because they lack enlarged ventral scutes, the midventral scale row being equal to the other body scales, the maximum number is found in *Megatyphlops schlegelii* (Schlegel's giant blind-snake) at 44 whereas the minimum number is 14 in the entire family Leptotyphlopidae (threadsnakes). Most higher snakes have an uneven scale row number as the vertebral or middorsal row is bordered on each side by an equal number of rows, leading to an odd number. However, some colubrids have even numbered scale rows throughout the body, including *Chironius* (sipos) with 10–12 and both *Spilotes* (chicken snakes) and *Zaocys* (keeled green snakes) with 14–18 rows. They are the only snakes outside of scolecophidians that consistently have even-numbered scale rows. Among the Henophidia, the maximum midbody scale row number is found in *Boa constrictor* (boa) with 101 and *Python sebae* (rock python) or *P. natalensis* (Natal rock python) with 99; the minimum number of 15 occurs in all *Xenopeltis* (sunbeam snakes) and most Uropeltidae (shieldtails). In the Caenophidia, the highest number of midbody rows occurs in Asian file snakes: *Acrochordus granulatus* (little file snake) with 212, *A. arafurae* (Arafura file snake) with 180 and *A. javanicus* (elephant-trunk snake) with 150. These are followed by *Kolpophis annandalei* (bighead sea snake) at 100, *Enhydrina schistosa* (beaked sea snake) at 99, and *Xenodermus javanicus* (rough-backed litter snake) at 60 rows. The minimum scale row number of 10 rows is found in seven species of *Chironius* (sipos), 11 scale rows occurs in *Dipsas indica* (snail eater) and *Psammophis angolensis* (dwarf sand snake), and many genera have only 13 rows at midbody (*Aplopeltura, Calliophis, Sinomicrurus, Stichophanes, Carphophis, Pseudablabes, Calamaria, Gongylosoma* and *Chilomeniscus*). The midbody scale rows range is from 10 to 212 in the snake kingdom.

Which midbody scale row counts are most commonly found in snakes? The winner is 17! There are 1045 species (24.5% of all species) with 17 midbody scale rows, 968 species with 15 scale rows, 674 species with 19 rows, 565 species with 21 rows, 483 species with 23 rows, 409 species with 25 rows, 249 species with 27 rows, 204 species with 13 rows, 152 species with 14 rows, 117 species with 31 rows, 106 species with 22 rows, and 103 species with 20 rows. A comparison of species that exhibit only a single number of midbody scale rows (invariable) with those species having more two or more scale row values (variable) reveals that three-quarters (72.4%) are invariable and one-quarter (27.6%) are variable with respect to midbody rows. The percentages of invariable vs. variable species in the three groups are: 72.4% and 27.6% in scolecophidians, 40.7% and 59.3% in

henophidians, and 74.5% and 25.5% in caenophidians.

Supralabials. The shields bordering the upper jaw between the rostral and angle of the mouth are the supralabials. In the scolecophidians, the leptotyphlopids *Namibiana labialis* (Damara threadsnake) and *N. occidentalis* (western threadsnake) have the fewest with only one, many others have just two. The highest number of four occurs is all the typhlopoid families. Among henophidians, both *Anomochilus* (dawn blindsnakes) and most Uropeltidae (shieldtails) have four supralabials whereas *Boa constrictor* has the most with 25. In the Caenophidia the record belongs to *Acrochordus arafurae* (Arafura file snake) and *A. javanicus* (elephant-trunk snake) with 36, followed by *Eristicophis macmahonii* (McMahon's desert viper) with 25, *Bitis nasicornis* (rhinoceros viper) with 21, *Xenodermus javanicus* (rough-backed litter snake) and *Enhydris enhydris* (rainbow mud snake) with 20. The fewest supralabials are found in the genus *Emydocephalus* (turtle-headed sea snake) with three but *Chilorhinophis gerardi* (Gerard's black-and-yellow burrowing snake), *Tetralepis fruhstorferi* (Fruhstorfer's mountain snake), and at least 11 *Calamaria* (reed snakes, i.e., *C. battersbyi, C. borneensis, C. buchi, C. gimletti, C. gracillima, C. linnaei, C. lovii, C. melanota, C. pavimentata, C. schmidti, C. septentrionalis*) have only four. The number of supralabials in snakes range from one to 36.

Maxillary teeth. The number of teeth on the maxillary bone of the upper jaw varies from none in the Leptotyphlopidae to 2–6 in all remaining scolecophidians. Among henophidians, the greatest number of maxillary teeth is found in *Xenopeltis unicolor* (sunbeam snake) at 51, followed by *Casarea dussumieri* (keel-scaled boa) at 38 and *Candoia carinata* (square-nosed island boa) with 33. The fewest maxillary teeth are in *Anomochilus monticola* (dwarf pipesnake) with two and *Rhinophis philippinus* (Peters' shieldtail) with five. In the Caenophidia the most teeth on the maxilla occur in *Scaphiodontophis annulatus* (shovel-toothed snake) at 59, *Sibynophis collaris* (many-toothed snake) at 54, *Chironius fuscus* (brown sipo) at 51, *Dendrophidion vinitor* (barred forest racer) with 50. The fewest number of maxillary teeth occur in *Homoroselaps lacteus* (spotted harlequin snake) with one front fang, followed by the Viperidae (vipers and pitvipers), Atractaspididae (stiletto snakes), and 20 genera of the Elapidae with only two front fangs, *Tomodon dorsatum* (pampas snake) with two rear fangs, *Pareas menglaensis* (Mengla slug eater) with three teeth, and *Brachyophis revoili* (Revoil short snake) and *Micrelaps muelleri* (Mueller's two-headed snake) with two teeth plus one rear fang. Ophidian maxillary teeth vary from one to 59 in different species.

Dentary teeth. The mandible of the lower jaw lacks teeth in three scolecophidian families (Gerrhopilidae, Xenotyphlopidae, Typhlopidae) whereas the Anomalepididae have 1–3 dentary teeth and the Leptotyphlopidae have 3–6 teeth. Henophidians with the most teeth include *Xenopeltis unicolor* (sunbeam snake) at 48, *Trachyboa boulengeri* (rough-scaled dwarf boa) with 27, and *Antaresia stimsoni* (large-blotched python) with 26. The fewest dentary teeth are found in *Anomochilus weberi* (Weber's pipesnake) with three and *Rhinophis gunasekarai* (Gunasekara earthsnake) with five. The greatest numbers of dentary teeth in caenophidians are found in *Scaphiodontophis venustissimus* (neck-banded snake) at 59, *Sibynophis collaris* (many-toothed snake) at 53, and *Amphiesmoides ornaticeps* (ornate keelback) at 50. Dentary teeth range from zero to 59 throughout snakes.

Diet. Many snakes can feed upon prey items that range up to half of their body weight. Most records of large meals by giant snakes only note the prey size, not the weight of the snake. Among the Henophidia, the largest recorded prey item by weight was a 60-kg (130-lb) impala by a *Python sebae* (rock python) although the maximum weight limit for any snake is estimated to be about 70 kg (150 lb). One of the largest prey/snake weight ratios was in a *Python bivittatus* (Burmese python) weighing 14 kg that swallowed a 16-kg white-tailed deer (115% of snake's weight). Within caenophidians, the largest known prey/snake ratio by weight was in a *Bothrops atrox* (common lancehead), which consumed a meal weighing 160% of its own weight (Greene, 1992). Among caenophidians, the largest prey/snake diameter ratio is found in the African *Dasypeltis* (egg eaters), where the snake can swallow an egg that is up to four times the diameter of its own head. At the opposite end of the feeding spectrum are snakes that are obligate feeders upon the smallest organisms, the Scolecophidia, which consume only ants, termites and/or their eggs. They hold the records for the largest snake/prey ratios by weight, exemplified by *Megatyphlops mucruso* (giant blindsnake) of Africa. With a length of 950 mm and a weight of 200 gm the snake is 100,000–200,000 times heavier than its ant (2 mg), termite (1 mg) or egg (0.5 mg) prey items.

What about fasting records of giant snakes? Fasting records are only available for a few species in captivity. *Eunectes murinus* (green anaconda) shares the fasting record with *Python sebae* (rock python) at 36 months, followed by another *Python sebae* at 33 months, *Bitis gabonica* (Gaboon viper) and *Python molurus* (Indian python) at 30 months, and *Malayopython reticulatus* (reticulated python) going without food for 28 months (Murphy and Henderson, 1997). An old record of four years for a Malagasy boa (*Acrantophis* or *Sanzinia*) in the Paris Zoo has not been authenticated.

Reproduction. The majority of snakes are oviparous (egg laying) but some groups are entirely ovoviviparous (live bearing). Many species in all three groups lay only a single egg or give birth to one neonate but at least ten species have records of more than 100 births. Among scolecophidians, all of which are known to be oviparous, the record number of eggs is 60 in the giant typhlopid *Megatyphlops mucruso* (giant blindsnake) with the record in leptotyphlopids belonging to *Rhinoleptus koniagui* (slender-snouted threadsnake) at 15. In the Henophidia, most of which are oviparous, the record belongs to *Malayopython reticulatus* (reticulated python) with 124, followed by *Python bivittatus* (Burmese python) with 111 and *Python sebae* (rock python) with 100. The live-bearing *Candoia paulsoni* (Pacific ground boa) is reported to have "nearly 100 babies" (Conway, n.d.) but the only verified number is 64. In the Caenophidia, the all-time maximum number of young in a single litter is 156 by *Bitis arietans* (puff adder), followed by *Nerodia sipedon* (northern water snake) with 132, *Notechis scutatus* (tiger snake) with 109, *Thamnophis sirtalis* (common garter snake) with 101, *Pseudaspis cana* (mole snake) with 95, *Thamnophis radix*

(Plains garter snake) with 92, and *Bothrops asper* (terciopelo) with 90 neonates. The record number of eggs in advanced snakes is 120 by *Fowlea piscator* (checkered keelback), 111 in *Farancia abacura* (eastern mud snake), and 105 in *Natrix natrix* (grass snake). Clutch and brood sizes in snakes vary from one (egg or neonate) to 124 eggs and 156 living young.

Longevity. The only longevity records available are those of snakes in captivity (Snider and Bowler, 1992). Among primitive snakes, the longevity record belongs to *Charina bottae* (rubber boa) and *Python regius* (ball python) at 50 years (Oskyrko et al., 2024), *Boa constrictor* (red-tailed boa) lived 42 years, *Python molurus* (Indian python) lived 40 years, *Eunectes murinus* (green anaconda) lived 33.5 years, *Loxocemus bicolor* (Neotropical sunbeam snake) almost 33 years, *Boa imperator* (Mesoamerican boa constrictor) lived 29 years, *Gongylophis conicus* (rough-scaled sand boa) and *Python bivittatus* (Burmese python) at 28 years, *Epicrates maurus* (northern rainbow boa) and *Python sebae* (rock python) at 27 years. Within advanced snakes the longest-lived species is *Crotalus horridus* (timber rattlesnake) at 36.5 years, *Pituophis catenifer* (gopher snake) at nearly 34 years, followed by *Lampropeltis californiae* (California kingsnake) at 33 years, *Agkistrodon contortrix* (copperhead) at nearly 30 years, *Boulengerina melanoleuca* (forest cobra) at 29 years, *Drymarchon couperi* (indigo snake) and *Crotalus atrox* (western diamondback) at nearly 26 years, and *Naja naja* (spectacled cobra), *Uraeus nivea* (yellow Cape cobra) and *Notechis scutatus* (tiger snake) at almost 24 years.

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Notes on Reproduction of Southern Cricket Frogs, *Acris gryllus* (Anura: Hylidae), from North Carolina

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Abstract

I conducted a histological examination of gonadal material from 31 adult *Acris gryllus* from North Carolina consisting of 14 males and 17 females. The smallest mature male (sperm in lumina of seminiferous tubules) measured 18 mm SVL. The smallest mature female (in spawning condition) measured 20 mm SVL. Seven of 15 (47%) *A. gryllus* females contained atretic follicles. The *A. gryllus* reproductive cycle in North Carolina commences in January and, based on the presence of gravid August females, continues into late summer.

Acris gryllus (LeConte, 1825) is a wide ranging species found in many different habitats in the southeastern United States; weather permitting they are active year-round (Dodd, 2023). It occurs from southeastern Louisiana and southwestern Tennessee, through Mississippi to southern Georgia, northeast to southeastern Virginia and throughout peninsular Florida (Frost, 2024). Elliott et al. (2009) reported *A. gryllus* breeds primarily from April through summer but may be heard any month. Females are slightly larger than males (Dodd, 2023). The ovary weight of *Acris gryllus* is highest in spring at the start of breeding and then declines into fall; it is active all year in Mississippi (Smith, 1975). Surges in breeding occur during rainfall (Turnipseed and Altig, 1975). Males call both day and night (Mount, 1975). Bayless (1966) found no mating *A. gryllus* after 8 April and thought this species might be an explosive breeder. Months of *A. gryllus* breeding by state are in Table 1. In the current paper I present data from a histological examination of *A. gryllus* gonads from North Carolina. Utilization of museum collections for obtaining reproductive data avoids removing additional animals from the wild.

A sample of 31 *A. gryllus* from North Carolina (Appendix) collected 1923 to 1975 consisting of 14 adult males (mean snout–vent length, SVL = 21.7 mm ± 1.6 SD, range = 18–24 mm), and 17 adult females (mean SVL = 23.7 mm ± 2.0 SD, range = 20–27 mm) was examined from the herpetology collection of the North Carolina State Museum (NCSM), Raleigh, North Carolina, USA.

A small incision was made in the lower part of the abdomen and the left testis was removed from males and a piece of the left ovary from females. Gonads were embedded in paraffin, histological sections were cut at 5 μm and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreibman, 1997). Histology slides were deposited at NCSM. An unpaired *t*-test was used to test for differences between male and female SVLs.

Testes of *A. gryllus* are surrounded by black pigment as previously reported by Rugh (1941) and Oplinger (1966) for *Pseudacris* (as *Hyla*) *crucifer.* The testicular morphology of *A. gryllus* is similar to that of other anurans as described in Ogielska and Bartmańska (2009a). Within the seminiferous tubules, spermiogenesis occurs in cysts which are closed until the late spermatid stage is reached; cysts then open and differentiating sperm reach the lumina of the seminiferous tubules (Ogielska and Bartmańska, 2009a). A tangled mass of spermatozoa or open sperm cysts was observed in the lumen of each seminiferous tubule. A ring of germinal cysts is located on the inner periphery of each seminiferous tubule. There was no discernible testicular cycle in my monthly samples of *A. gryllus* males (N = 14) as all exhibited spermiogenesis (sperm formation): February (N = 1), March (N = 2), May (N = 2), June (N = 1), July (N = 2), August (N = 5), December (N = 1). Smith (1975)

Table 1. Months of breeding by state for *Acris gryllus*.

Location	Breeding Period	Source
Alabama	peak in April to early June	Mecham, 1964
Alabama	call March to August	Mount, 1975
Carolinas and Virginia	late spring and summer	Beane et al., 2010
Florida	all months	Carr, 1940
Florida	year-round in south, late spring and summer in north	Krysko et al., 2019
Georgia	most breeding April to June	Jensen et al., 2008
Louisiana	March to October	Boundy and Carr, 2017
Mississippi	call from mid-March through mid-August	Smith, 1975
North Carolina	call February to October	Dorcas et al., 2007
South Carolina	call spring and late summer	Gibbons and Semlitsch, 1991
Southeast	April to October	Dorcas and Gibbons, 2008
Tennessee	mid spring to late summer	Niemiller and Reynolds, 2011

Table 2. Two stages in the ovarian cycle of 17 *Acris gryllus* adult females from North Carolina.

Month	*n*	Ripening (= vitellogenic)	Spawning condition
January	1	0	1
March	3	1	2
April	3	2	1
May	2	0	2
June	3	0	3
July	1	0	1
August	4	0	4

similarly reported sperm were abundant in all seasons with no indication of seasonal variation in the testis cycle of *A. gryllus* from Mississippi. The smallest sexually mature *A. gryllus* male measured 18 mm SVL (NCSM 3782) and was from February. Wright and Wright (1949) reported adult males of *A. gryllus* (as *Acris gryllus gryllus*) ranged 15–29 mm SVL in body size.

The mean SVL of *A. gryllus* females was significantly larger than that of males ($t = 3.0$, df = 29, $P = 0.0051$). The ovaries of *A. gryllus* are similar to those of other anurans in being paired organs lying on the ventral sides of the kidneys; in adults the ovaries are filled with diplotene oocytes in various stages of development (Ogielska and Bartmańska, 2009b). Mature oocytes are filled with yolk droplets; the layer of surrounding follicular cells is thinly stretched. Two stages were present in the spawning cycle (Table 2): (1) "Ripening (= vitellogenic)" in which ripening oocytes (accumulating yolk) predominated as reported in Uribe Aranzábal (2011); (2) "Spawning Condition" in which mature oocytes predominated. The smallest mature female *A. gryllus* (ready to spawn) measured 20 mm SVL (NCSM 14574) and was from April. My one January *A. gryllus* female in spawning condition suggests the next period of spawning has started. Wright and Wright (1949) reported adult females of *A. gryllus* (as *Acris gryllus gryllus*) ranged 16–33 mm SVL in body size.

Seven of fifteen (47%) *A. gryllus* females contained atretic follicles. Atresia is a widespread process occurring in the ovaries of all vertebrates (Uribe Aranzábal, 2009). It is common in the amphibian ovary (Saidapur, 1978) and is the spontaneous digestion of a diplotene oocyte by its own hypertrophied and phagocytic granulosa cells which invade the follicle and eventually degenerate after accumulating dark pigment (Ogielska and Bartmańska, 2009b). See Saidapur and Nadkarni (1973) and Ogielska et al. (2010) for detailed descriptions of follicular atresia in the frog ovary. Atresia plays an important role in fecundity by influencing numbers of ovulated oocytes (Uribe Aranzábal, 2011).

In conclusion, the *A. gryllus* reproductive cycle in North Carolina commences in January and continues into late summer. This is in accordance with data on *A. gryllus* reproduction from previous studies (Table 1) and my information (Table 2).

Acknowledgments

I thank Bryan Stuart (NCSM) for permission to examine *A. gryllus* and Jeff Beane (NCSM) for facilitating the loan: HERP-328.

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Appendix

Thirty-one *A. gryllus* from North Carolina examined (by county) from the herpetology collection of the North Carolina State Museum (NCSM), Raleigh, North Carolina, USA.; **Beaufort**: NCSM 11683, 11684, 11685; **Bertie**: NCSM 13457; **Bladen:** NCSM 2630, 14863, 57005; **Brunswick**: NCSM 12502, 57017; **Carteret:** NCSM 3138, 3139, 9106, 9107, 9111; **Columbus:** NCSM 6157, 14448; **Moore:** NCSM 14574; **New Hanover:** NCSM 1344, 3782; **Onslow:** NCSM 7714, 7798, 7799, 13988; **Pamlico:** NCSM 5418, 5419, 7115; **Pender:** NCSM 10220, 10226, 14295; **Sampson:** NCSM 57037; **Scotland:** NCSM 11022.

Minutes of the CHS Board Meeting, March 14, 2023

A virtual meeting of the CHS board of directors via a Teams conference video/call was called to order at 7:06 P.M. Board members Kyle Houlihan and Amelia Pollock were absent. Minutes of the December 12 board meeting were read and accepted.

Officers' Reports

Vice-president: Amelia Pollock has informed the board via email that the Notebaert Museum would like to restart the Cold-blooded Weekends. Also, we have access to the library again.

Media secretary: Gabby Evans is experimenting with what is working. Instagram is mostly 20- to 30-year-olds. Tik-Tok is more teens and early 20s. Facebook is older followers.

Sergeant-at-arms: Tom Mikosz reported that the February 18 Junior Herpers meeting had 14 attendees; 21 people attended the general meeting.

Committee Reports

Junior Herpers: Caitlin Monesmith reported that Sunday's meeting would feature a St. Patrick's Day theme.

Shows: Gail Oomens has scheduled two shows so far in southern Forest Preserves: May 18 and June 8. The CHS will also be present July 13–14 at the St. Andrews Greek Fest, 5649 N. Sheridan Road, in Chicago.

New Business

We need to find several new officers for the CHS. Caitlin is deciding if she will take over as vice-president when Amelia withdraws in August.

The meeting adjourned at 8:30 P.M.

Respectfully submitted by Gail Oomens

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Herpetological Art at the Brookfield Zoo, Brookfield, Illinois — July 27, 2023

Photos and story by
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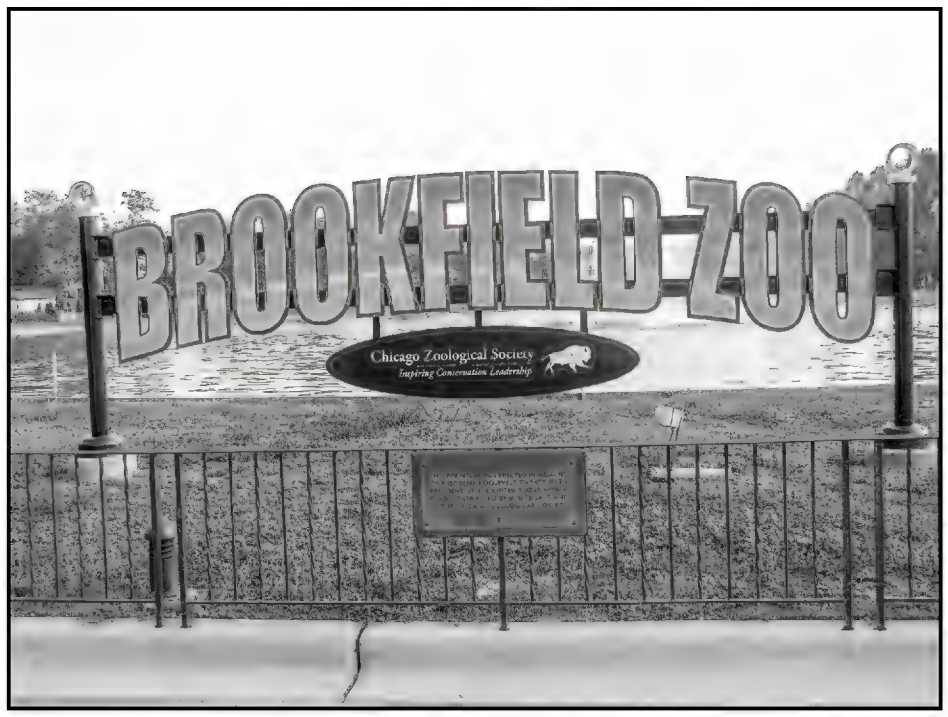
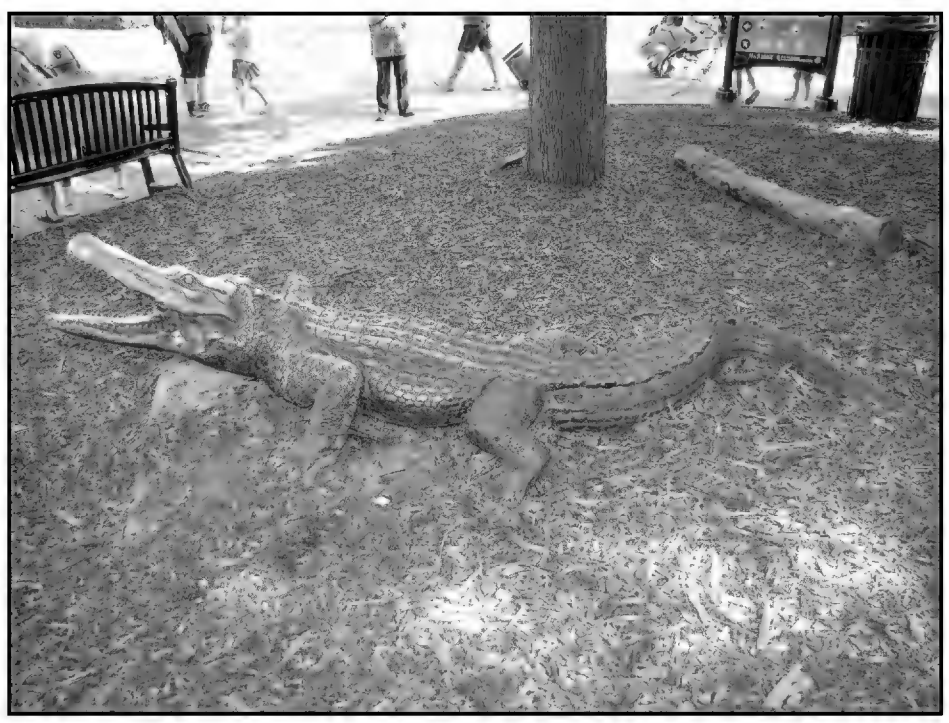
The 45th International Herpetological Symposium that was held in Schaumburg, Illinois (a suburb of Chicago), included a visit to the Brookfield Zoo and a banquet in the Pavilion section of the zoo. The Brookfield Zoo has about 450 species of animals on 216 acres, and is AZA accredited.

Two charter buses brought us to the south gate of the zoo. Near the gate are black metal silhouettes of various zoo animals. One of them is some kind of turtle-like image which might be several inches long. Similar metal panels are scattered around the zoo.

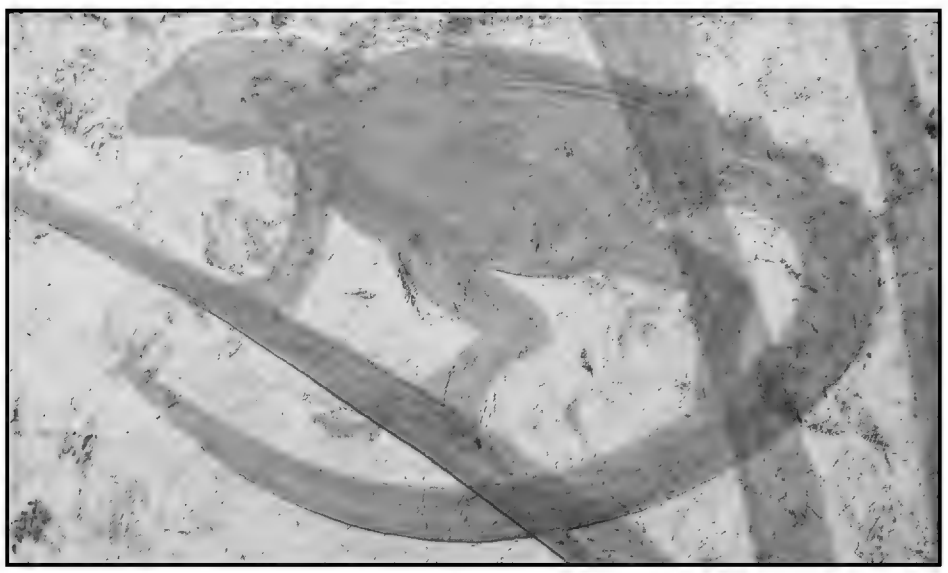


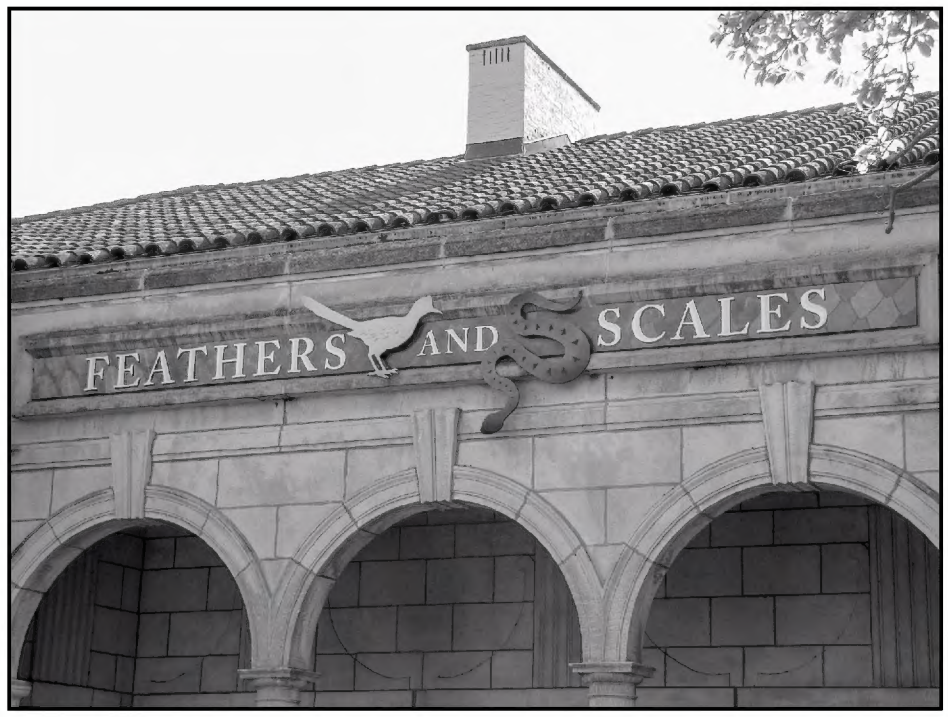
Near a building identified as "The Swamp" is a large bronze statue of an American alligator, *Alligator mississippiensis*, which is the size of a real adult alligator. There are many shiny spots where children have "petted" the statue and sat on it. The statue was made so that the alligator is in the position of turning its head around to maybe look at something.



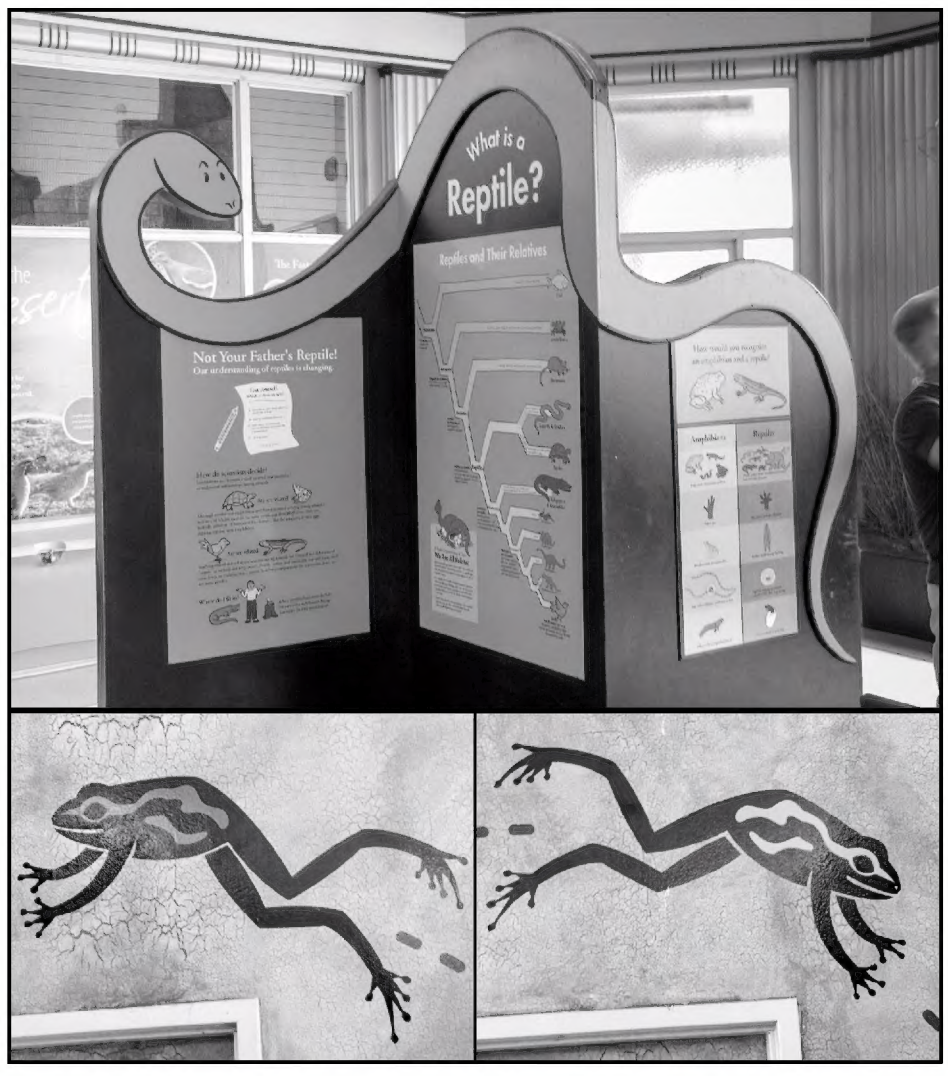
In front of the Swamp building are open areas with several posts that hold cloth banners that read "SHARE SOMETHING WILD," and show different zoo animals plus, next to the cloth banners, there are plate images of several different zoo animals including one that has the image of a large green lizard that, because of the bands on the tail, I think represents a green iguana (*Iguana iguana*).

We next visited the "Reptiles & Birds" building, which includes an open area with birds flying around as well as displays of reptiles and amphibians. On the walls above the reptile displays are many painted images of snakes, lizards and frogs that are perched on branches. All of these images are a faded green that I think means that they have been there for a very long time.



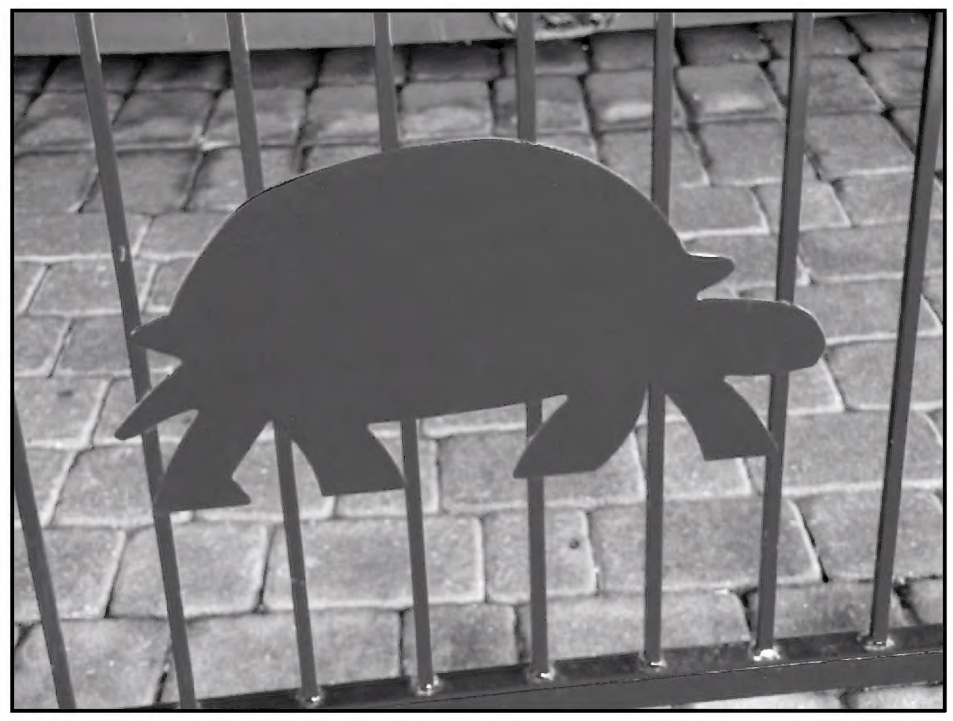


The "Feathers & Scales" building was next on our tour, with more displays of reptiles, amphibians and birds. Above the doors to the entrance of the building is a sign that reads, "FEATHERS AND SCALES" and shows the outline of a road-runner and a snake. The snake is tan with a pattern of faded red triangles. Inside this building is a large display of a tan-colored snake with charts that explain the differences between reptiles, amphibians and other animals. On two different walls are painted images of frogs. One frog is black and red and the other frog black and green and both are shown in mid-hop.



Near the North Gate is a building called the "Discovery Center" and inside is a concrete panel, several feet long, several feet tall, and several inches thick, with carved-out insets showing many different kinds of animals that might be found in zoos. One inset shows a crocodilian; another shows two turtles, both of these herpetological displays are approximately 15 to 18 inches wide.

Also near the North Gate is a carousel with several herp-themed benches and seats meant for riding. There is a green metal fence around the carousel, and this shows plates of many animals including a turtle-like image that might be almost 20 inches long.



Above the carousel rides are colorful panels (named for the zoo buildings) that show many different scenes of animals. The one named "THE SWAMP" shows two American alligators in a swamp with two birds in the background and what could be an alligator snapping turtle, *Macrochelys temminckii*, except that it's basking on a patch of dry ground. The panel called "FEATHERS AND SCALES" shows many reptiles, a few amphibians, but no birds. It includes four species of snakes, eight species of lizards, a turtle that looks like a spotted turtle, *Clemmys guttata*, a chelonian that looks like some kind of tortoise, a blue frog, a green frog and, from its stance, what might be a toad.

Two of the carousel seats have snakes; each incorporates two snakes on a branch, and a saddle shaped like a leaf. On one of the rides one of the snakes is colored black with a brown ventral surface and the other snake has a background of a light tan with black blotches covering its body. On the other ride one of the snakes is colored green and yellow with black blotches that make this look like a green anaconda, *Eunectes murinus*, and the other snake is colored with yellow and orange bands with many small black spots, I don't know if the yellow and orange snake is meant to resemble a real snake of some kind.

Other carousel seats include a green frog, a black and yellow frog that has a blue pattern on its legs, a green turtle that has some yellow and red marks, a yellow turtle that has a black pattern on its scutes, and a bench where the outward-facing panel shows six meerkats and two snakes on tree branches. One of these snakes is brown with a yellow ventral surface and the other snake is green with yellow ventral scales. The carousel operators told me that traditional carousels have horse rides, but there is a manufacturer that builds carousels with exotic animals that you would find in zoos.

From the Brookfield Zoo's web site, I found the contact link and asked about their carousel. The following is the information that I received: "The company that created our carousel was Carousel Works. They opened in 1986 initially repairing carousels. They designed and built their first one in 1991 for the Richland Carousel Park. Sadly, they filed for bankruptcy in 2021. I'm not sure if they specialized in carousels for zoos but know they produced carousels and merry-go-rounds for other institutions. Our carousel opened on May 27, 2006."

At the entrance to the zoo near the ticket booths where you pay to park there are some images of lizards shown climbing. With time constraints to get around the zoo, the banquet and getting back to the buses to get back to the hotel I didn't have any time to get pictures of these lizard images.

UPCOMING MEETINGS

Monthly meetings of the Chicago Herpetological Society begin at 2:00 P.M. on the third Sunday of each month. Please try to join us *in person* at the Notebaert Nature Museum, 2430 N. Cannon Drive, Chicago. The next meeting will take place on Sunday, April 21. Due to a last-minute cancellation, the program has not yet been decided.

At the May 19 meeting **Luke Stevens** from the Lincoln Park Zoo will speak on "From Herps to Hoof Stock: A Zookeeper's Path from Passion to Profession."

Please check the CHS website or Facebook page each month for information on the program.

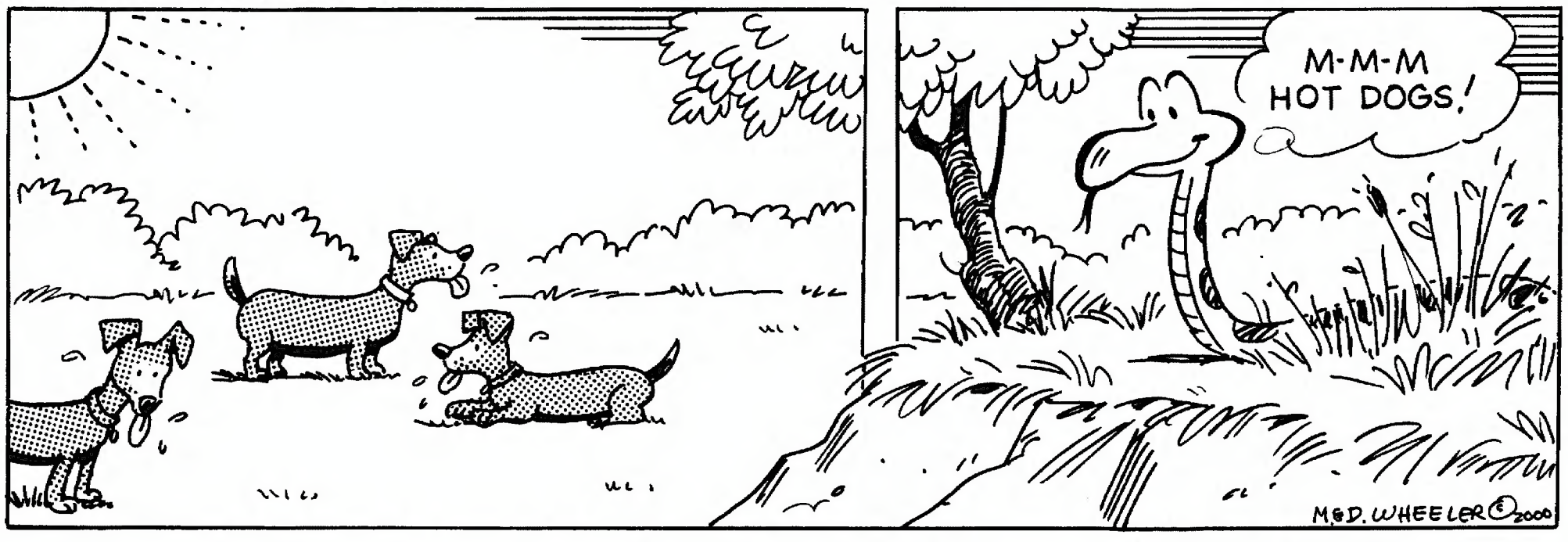
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? The next board meeting will be held online. If you wish to take part, please email: rcrowley@chicagoherp.org.

NEW CHS MEMBERS THIS MONTH

Nicole McReynolds
Mitzy Chavez

THE ADVENTURES OF SPOT



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